

Sheet 3

1) Suppose client "A" initiates a Telnet session with server "S". At about the same time, client "B" initiates a Telnet session with server "S". Provide source and destination Port numbers for.

a) segments sent from A to S.

src = 2000 (random)

~~dst~~ = dst = 23 (telnet)

b) segments sent from B to S

src = 3555 (random)

dst = 23

c) segments sent from S to A

src = 23 (telnet) dst = 2000 (random)

d) segments sent from S to B

src = 23 (telnet) dst = 3555 (random)

e) if A, B different hosts, it is possible that src. port number in segments from A to S is same with segments sent from B to S?

↳ It is possible for different processors in different hosts to have same port number.

f) what about if it is the same host?

↳ It is not possible.

[3] UDP & TCP use 1's complement for their checksums.

Suppose you have the following three 8-~~bit~~^{bit} bytes
01010011, 01100110, 01110100

a) what is the 1's complement of sum of them (Note that TCP use 16-bit words in computing checksum, for this problem you are being asked to use 8-bit sums?)

$$\begin{array}{r} 01110100 \\ 01100110 \\ 01010011 \\ \hline 00101101 \quad \text{Sum} \\ \hline 11010010 \quad \text{1's complement} \end{array}$$

b) why UDP uses 1's comp.?

↳ to Add 1's complement to sum of data to check errors.

c) Is it possible that 1-bit error will go undetected?

↳ No

d) How about 2-bit error?

↳ It is possible.

[2]

~~[3] [4] [5] [6] [7] [8] [9] [10] [11] [12] [13] [14] [15] [16] [17] [18] [19] [20] [21] [22] [23] [24] [25] [26] [27] [28] [29] [30] [31] [32] [33] [34] [35] [36] [37] [38] [39] [40] [41] [42] [43] [44] [45] [46] [47] [48] [49] [50] [51] [52] [53] [54] [55] [56] [57] [58] [59] [60] [61] [62] [63] [64] [65] [66] [67] [68] [69] [70] [71] [72] [73] [74] [75] [76] [77] [78] [79] [80] [81] [82] [83] [84] [85] [86] [87] [88] [89] [90] [91] [92] [93] [94] [95] [96] [97] [98] [99] [100]~~

26 Consider transferring an enormous file of L bytes from host A to host B, Assume an MSS of 536 bytes.

a. What is the maximum value of L such that TCP sequence numbers are not exhausted? recall that TCP sequence number field has 4 bytes.

$$\text{maximum } L = 2^{32} \text{ Byte (packet size)}$$

b. For L in (a), find how long it takes to transmit the file. Assume that 66 bytes of transport, network and data link header are added to each segment before resulting packet is sent out over 155 Mbps link (ignore flow and congestion control)

$$\text{no. of segments} = \frac{2^{32} B}{536 B} = 8012999 \text{ segments}$$

$$\text{Total size of header} = 66 \times 8012999 = 528857913 \text{ Byte}$$

$$\text{Total size of data} = 2^{32} + 528857913 = 4823825209 \text{ Byte}$$

$$\text{Time} = \frac{8 \times 4823825209}{155 \times 10^6} = 249 \text{ sec}$$

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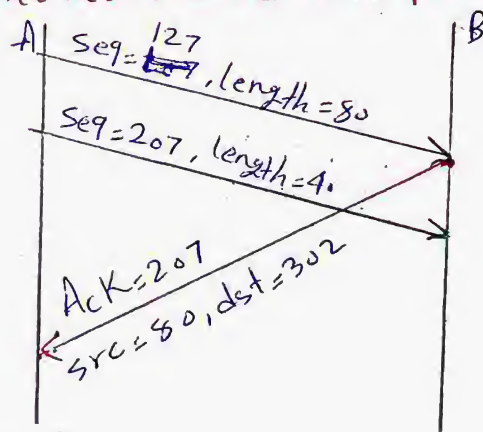
[27] Host A, B communicating over TCP connection, and host B already received from A all bytes up through byte 126. Suppose host A then sends two segments to host B back-to-back. First and second segments contain 80 and 40 bytes of data respectively. 1st segment (sequence number = 127, src. port number = 302, dst. port number = 80) Host B sends acknowledgment whenever it receives segment from Host A.

a) in 2nd segment sent from A to B, what are the sequence number, src. port number and dst. port no.?

sequence no. = 207

src port no. = ~~302~~ 302

dst. port no. = 80



b) if first segment arrives before 2nd segment, in the acknowledgment of first arriving segment, what is

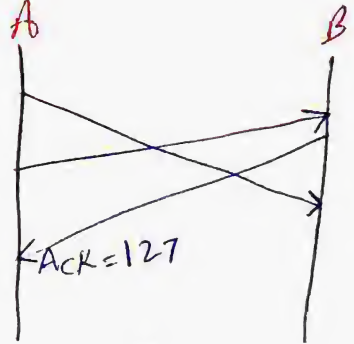
Acknowledge no. = 207

src. port no. = 80

dst port no. = 302

c) if 2nd segment arrives before 1st one, in the acknowledgment of first arriving segment What is the acknowledgment number? A

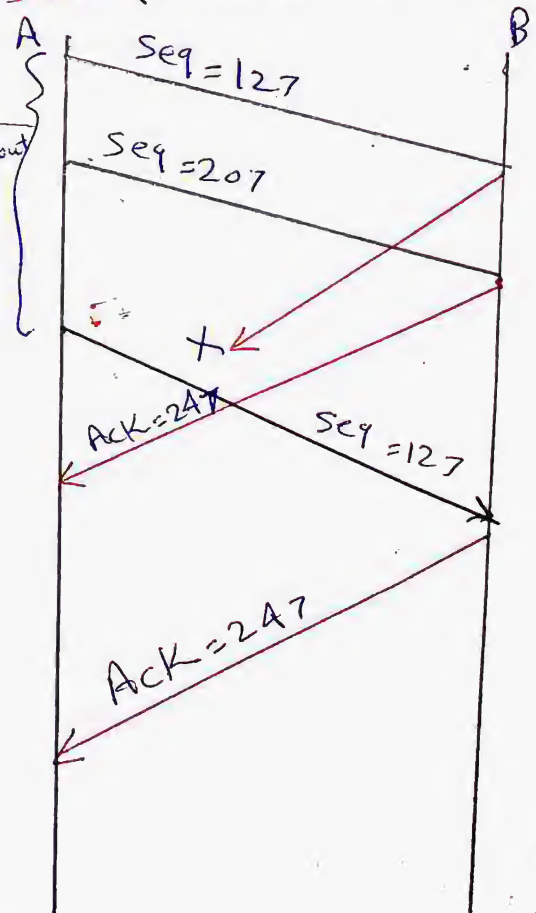
Ack no. = 127



d) suppose the two segments sent by A arrive in order at B. First Ack. is lost and 2nd Acknowledgment arrives after first time-out interval. Draw training diagram show these segments and all other segments sent (Assume there is no additional packet loss)

For each segment, provide (time-out) sequence number and no. of bytes of data, for each Ack. that you add,

Provide ~~ack~~ ack. number



31) Suppose that the five measured sample RTT values (section 3.5.3 reference) are 106ms, 120ms, 140ms, 90ms and 115ms a) Compute estimated RTT after each of these sample RTT values, using $\alpha = 0.125$ and assume that estimated RTT was 100ms just before first of five samples were obtained?

$$\text{Estimated RTT} = (1 - \alpha) \text{Estimated RTT} + \alpha \text{ sample RTT}$$

$$1^{\text{st}} \text{ value} \rightarrow \text{ETT} = 0.875 \times 100 + 0.125 \times 106 = 100.75 \text{ ms}$$

$$2^{\text{nd}} \text{ value} \rightarrow \text{ETT} = 0.875 \times 100.75 + 0.125 \times 120 = 103.15 \text{ ms}$$

$$3^{\text{rd}} \rightarrow 107.76 \text{ ms}$$

$$\& \text{ 4th} \rightarrow 105.54 \text{ ms}$$

$$5^{\text{th}} \rightarrow 106.72 \text{ ms}$$

b) Compute also DevRTT after each sample obtained assume $\beta = 0.25$ (value of DevRTT was 5ms) & Compute TCP timeout interval after each ~~of~~ samples obtained.

$$\text{DevRTT} = (1 - \beta) \cdot \text{DevRTT} + \beta | \text{Sample RTT} - \text{Estimated RTT} |$$

$$\text{Timeout interval} = \text{Estimated RTT} + 4 \times \text{DevRTT}$$

Dev RTT

Timeout-Interval

$$1^{\text{st}} \rightarrow 5.0625 \text{ ms}$$

$$121 \text{ ms}$$

$$2^{\text{nd}} \rightarrow 8 \text{ ms}$$

$$135.15 \text{ ms}$$

$$3^{\text{rd}} \rightarrow 14.06 \text{ ms}$$

$$164 \text{ ms}$$

$$4^{\text{th}} \rightarrow 14.43 \text{ ms}$$

$$163.26 \text{ ms}$$

$$5^{\text{th}} \rightarrow 12.8925 \text{ ms}$$

$$158.29 \text{ ms}$$

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